**APPENDIX 1. Details of variables used to calculate fit measures and their variation among basins.**

**Table A1.1** River basins in dataset with codes for river basins (country) used in figures in appendix.

| Code | River basin name / country |
|---|---|
| 1 | Biobio/Chile |
| 2 | Catamayo/Peru |
| 3 | Catamayo/Ecuador |
| 4 | Cauca/Colombia |
| 5 | Quaraí/Brazil |
| 6 | Cocibolca/Nicaragua |
| 7 | Baker/Chile |
| 8 | Cuareim/Uruguay |
| 9 | Guayas/Ecuador |
| 11 | Norrström/Sweden |
| 12 | Nura/Kazahstan |
| 13 | Okavango/Namibia |
| 14 | Thames/UK |
| 15 | Kyoga/Uganda |
| 16 | Niger/Mali |
| 17 | BangPakong/Thailand |
| 18 | Volga/Russia |
| 19 | Brahmaputra/Bhutan |
| 20 | Brahmaputra/India |
| 21 | Brahmaputra/Nepal |
| 22 | Tisza/Hungary |
| 23 | Guadiana/Spain |
| 24 | Elbe/Germany |
| 25 | Rhine/TheNetherlands |
| 26 | Amudarya/Uzbekistan |
| 27 | Orange/SouthAfrica |
| 28 | RedRiver/Vietnam |
| 29 | Olifants/SouthAfrica |

**Table A1.2** Variables and expressions used to calculate derived fit measures. Numbers following letter 'q' refer to questions in the Twin2Go questionnaire which are briefly summarized in lists below each expression.

| Fit Measure | Contributing variables and full expressions for calculating derived measures |
|---|---|
| **F1 Allocation** | **C1 Water scarcity** =1-( (5-q59)/4+(5-q60)/4+(5-q61)/4 +(5-q62)/4+(5-q58)/4+(4-q56)/3+(4-q90)/3)/7<br>58 national per capita theoretical maximum<br>59 water avail at basin level<br>60 annual renewable water supply per person<br>61 projected renewable water supply in 2025<br>62 relative water stress index (supply vs demand)<br>56 climate moisture index<br>90 Groundwater use<br>**I1 Capacity to manage shortages** = ((3-q13)/2+(3-q14)/2+(3-q15)/2+(3-q16)/2+(4-q95)/3+(4-q96)/3+(4-q2)/3)/7<br>13 irrigation water priced<br>14 household water priced<br>15 industry water priced<br>16 tradeable permits<br>95 hydro monitoring<br>96 groundwater understanding<br>2 water use rights clear<br>**F1 Allocation =** I1/(C1+1) |
| **F2 Integration** | **C2 Complexity of uses & users** = ((4-q43)/3+(4-q44)/3+(5-q46)/4+(5-q69)/4+(5-q72)/4+(3-q67aGrp)/2)/6<br>43 proportion in rural areas)<br>44 Development (HDI)<br>46 Per capita GDP<br>69 access to drinking water<br>72 access to sanitation<br>67a basin size<br>**I2 Capacity to integrate/coordinate uses** = ((3-q5)/2+(3-q24)/2+(3-q25)/2+(3-q26)/2+(5-q1)/4+(3-q6)/2+(3-q7)/2+(5-q34)/4+(5-q35)/4+(3-q36)/2+(3-q76)/2+(5-q47)/4+(4-q3)/3)/13<br>5 integration of domestic water legislation<br>24 formalized IWRM principles<br>25 status of implementation<br>26 capacity to implement<br>47 Effective formal institutions (CPI)<br>76 Efficient & effective<br>6 multilevel structure<br>34 vertical coordination<br>35 horizontal coordination |

| | |
|---|---|
| | 36 role of local governments<br>1 domestic water law<br>7 administrative structure<br>3 law traditional uses<br>**F2 Integration =** I2/(C2+1) |
| **F3 Conservation** | **C3 Threats to ecosystems** = 1- ((3-q65)/2+(3-q66)/2+(5-q62)/4+(4-q87)/3+(4-q88)/3+(4-q89)/3)/6<br>62 Water Stress index<br>65 extent of flow/channel modification<br>66 impact of land on hydrological processes<br>87 Aquatic biodiversity<br>88 Invasives<br>89 Surface/groundwater quality<br>**I3 Capacity to manage ecosystem threats** = ((5-q4)/4+(3-q17)/2+(3-q18)/2+(3-q19)/2+(3-q20)/2+(3-q21)/2+(2-q28)/1+(3-q92)/2+(3-q93)/2+(3-q94)/2)/10<br>4 flow availability/ecol requirement law<br>17 polluter pays<br>18 environmental subsidies<br>19 payments for ecosystem services<br>20 tradeable permits<br>28 integration of wetlands<br>21 environmental tax<br>92 water allocated for ecosystems<br>93 pollution incidents<br>94 water quality monitoring<br>**F3 Conservation =** I3/(C3+1) |
| **F4 Basin management** | **C4 Difficulty of basin-level management** = 1- *((5-q60)/4+(3-q66)/2+(5-q59)/4+(5-q62)/4+*(q67aGrp-1)/2*+(4-q90)/3+(2-q67b)/1)/7*<br>66 land use impacts<br>67b transboundary (1=Yes)<br>67a basin size (larger is more difficult)<br>59 water avail at basin level<br>60 annual renewable water supply per person<br>62 relative water stress index (supply vs demand)<br>90 groundwater<br>**I4 Capacity to manage at basin level =** *((4-q8)/3+(4-q10)/3+(3-q11)/2)/3*<br>8 basin organization<br>10 legislated basin principles<br>11 water basin strategies<br>**F4 Basinization =** I4/(C4+1) |
| **F5 Participation** | **C5 Diversity of interests** = 1-(1-abs(q43-3)/2+(5-q45)/4)/2<br>45 Income equality (GINI) – higher inequality => more diverse interests |

| | |
|---|---|
| | 43 Population rural (intermediate fraction => more diverse interests)<br><br>**I5 Capacity to engage stakeholders and public =** ((5-q74)/4+(3-q79)/2+(3-q80)/2+(3-q50)/2+(3-q51)/2+(3-q75)/2+(3-q49)/2+(3-q77)/2)/8<br><br>74 participatory decision-making practice<br>79 deliberative engagement opportunities<br>80 inclusiveness of stakeholder participation<br>50 participatory decision-making on books<br>51 transparency regarding allocation on books<br>75 transparent allocation in practice<br>49 Presence of avenues of dissent<br>77 equitable & inclusive<br><br>**F5 Participation =** I5/(C5+1) |
| **F6 Adaptation** | **C6 Variability and uncertainty =** 1-((*3-q57)/2+ABS(3-q67)/2)/2*<br><br>57 climate moisture variation<br>67 uncertainty of projections (mid)<br><br>**I6 Capacity to manage variability, uncertainties and change =** ((3-q29)/2+(3-q30)/2+(3-q31)/2+(3-q32)/2+(3-q33)/2+(3-q54)/2+(4-q81)/3+(5-q82)/4+(3-q83)/2+(4-q84)/3+(5-q85)/4+(3-q86)/2+(4-q95)/3+(3-q94)/2+(3-q96)/2)/15<br><br>29 practices for dealing with uncertainties<br>30 reversible and flexible options<br>31 safety margins<br>32 use scenarios<br>33 climate variability & change<br>81 climate change strategy<br>82 adaptation knowledge<br>83 awareness of water managers<br>84 coordinated climate plan<br>85 operational activities<br>86 ways to deal with variability<br>54 IWRM & CC predictability<br>94 Water quality monitoring<br>95 Hydro-meteorological monitoring<br>96 Understanding of groundwater resources<br><br>**F6 Variation =** I6/(C6+1) |

**Figure A1.1** Variation in the condition and institutional components of the allocation fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.

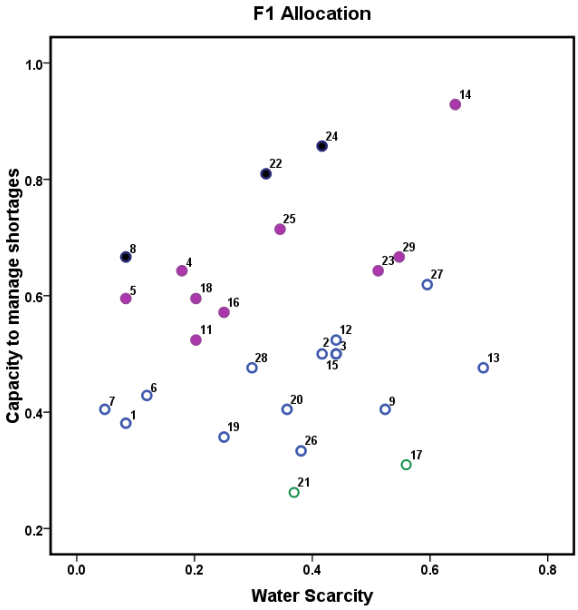


**Figure A1.2 V**ariation in the condition and institutional components of the integration fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.

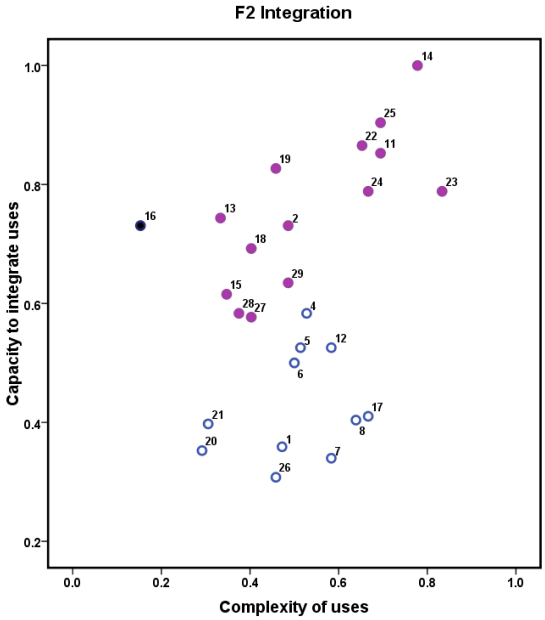

**Figure A1.3 V**ariation in the condition and institutional components of the conservation fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.

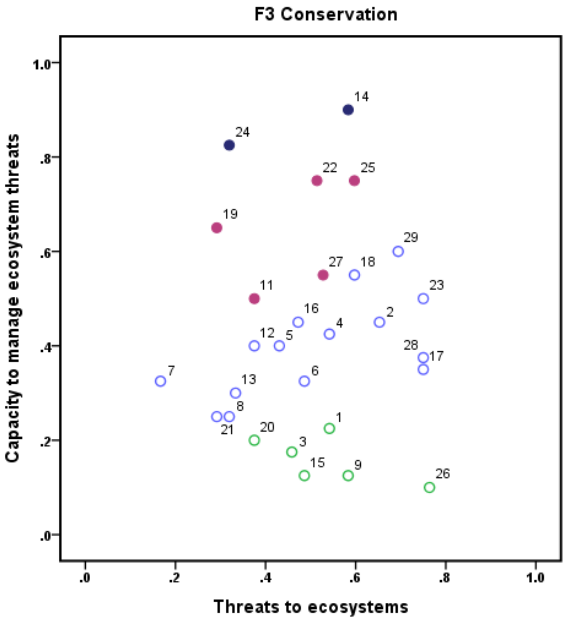


**Figure A1.4 V**ariation in the condition and institutional components of the basinization fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.

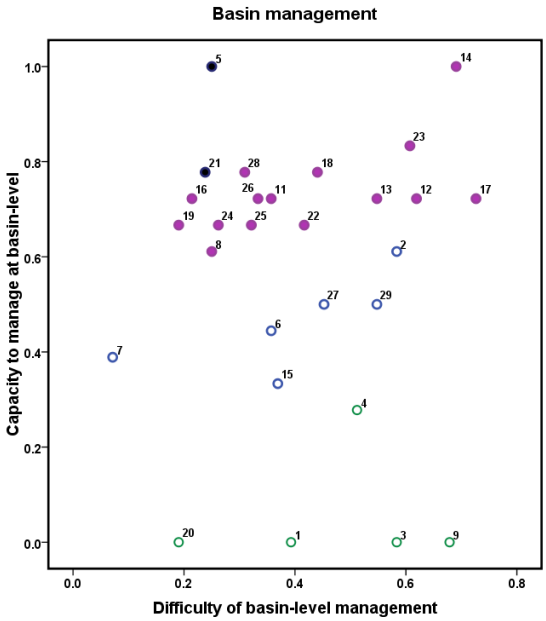

**Figure A1.5 V**ariation in the condition and institutional components of the participation fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.

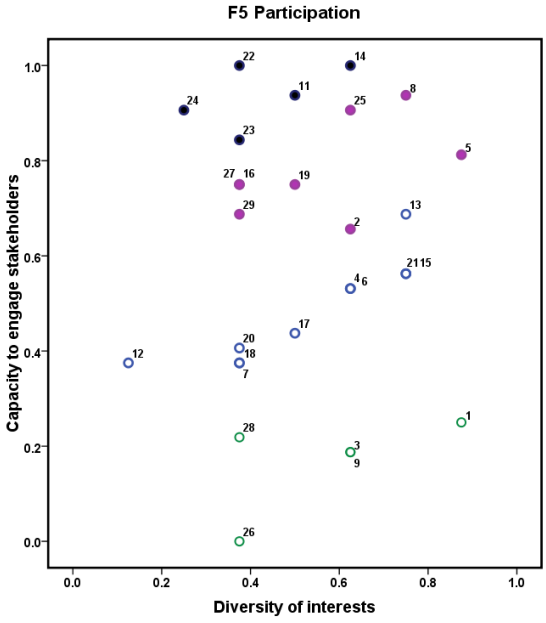


**Figure A1.6 V**ariation in the condition and institutional components of the adaptation (or variation) fit measure across 28 basins. Darker and more solid circles indicate higher relative fit score. Numbers indicate basins as listed in Table A1.1.